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REPORT

OF THE

TECHNICAL TASK FORCE

ON

SNOW DISPOSAL

IN THE

METROPOLITAN TORONTO AREA

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MINISTRY OF THE ENVIRONMENT

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FEBRUARY 1972

TABLE OF CONTENTS

		PAGE
1.	INTRODUCTION	1
2.	PRESENT SNOW DISPOSAL PRACTICES	2
	- City of Toronto	2
	- Metropolitan Toronto	3
	- Borough of North York	3
	- Borough of Etobicoke	3
	- Borough of Scarborough	3
	- Borough of East York	4
	- Borough of York	4
	- Department of Transportation & Communications	4
	- Private Sector	4
	- Interim Plan of Operations	4
3.	ENVIRONMENTAL IMPACT OF SNOW DISPOSAL PRACTICES	6
	a) Results of Preliminary Water Quality Investigations	6
	b) Environmental Impact of Existing Disposal Practices	7
	c) Continuing Monitoring Program	10
	i) General	10
	ii) Sampling Program Related to Direct Dumping	10
	iii) Sampling Program Related to Direct Dumping	11
	iv) Sampling Program Related to Land Disposal of Snow	11
4.	LONG-TERM PROGRAM	11
	RECOMMENDATION	12
	REFERENCES	13
	MEMBERS OF THE TASK FORCE	14

REPORT OF THE TECHNICAL TASK FORCE ON SNOW DISPOSAL IN THE METROPOLITAN TORONTO AREA

1. INTRODUCTION

The snow melting, removal, collection and disposal practices in the Metropolitan Toronto region vary considerably in relation to the needs of the municipalities, the Ontario Department of Transportation and Communications and the private sector.

The population of the region is highly mobile and has become dependent on an efficient private and public transportation system for pleasure, business and industry. The development of a program to handle snow and ice, to protect life and property and to maintain the efficiency of the transportation system, has paralleled the growth of the transportation network.

A considerable amount of research has been carried out in Ontario and North America on snow handling practices to increase their efficiency and to reduce their adverse effects. The Honourable George A. Kerr, Q.C., the former Minister of the Department of the Environment, and the Ontario Water Resources Commission have recently expressed concern about the possible adverse effects of snow disposal on the environment. Preliminary studies have indicated measurable quantities of pollutants in snow.

On the basis of this information the Minister requested all municipalities in Ontario to review their snow handling practices and specifically to eliminate direct disposal of snow to lakes and rivers wherever possible.

Snow disposal in the Metropolitan Toronto region consisted of direct lake dumping, land disposal, snow melting and in one instance, disposal to the sanitary sewer system.

Snow from the downtown core area where the largest volume of snow is collected and where the greatest need for collection exists was dumped directly into Lake Ontario. The area is intensively developed and consequently land disposal sites are not readily available.

Following the request of the Minister of the Department of the Environment, the direct dumping of snow into Lake Ontario has been stopped in the Metropolitan Toronto area by the Toronto Harbour Commissioners and the Metropolitan Toronto Region Conservation Authority and temporary alternative land disposal sites have been established. Consequently, at the invitation of the Minister, a Technical Task Force has been appointed to study the overall problem.

The Task Force respectfully submits this report, outlining the present snow melting, removal, collection and disposal practices; a proposed interim plan of operation covering the remainder of the 1972 snow season and the 1972-73, 1973-74 and 1974-75 seasons, the environmental impact of snow disposal, a continuing program of snow quality monitoring, and finally the need to develop a long term plan for snow disposal.

2. PRESENT SNOW DISPOSAL PRACTICES

City of Toronto

The Department of Streets is responsible for the winter maintenance of 533 miles of roadway including 78 miles of primary roads from which snow is completely removed. In addition, there are 980 miles of sidewalks and 157 miles of lanes under this jurisdiction.

With an average winter snowfall in the City of Toronto of around 55 inches and with approximately two-thirds of this coming in falls of 3 or more inches, the Streets Department, during the course of the winter months, is called upon at least a half-dozen times to plow all streets in the City and to completely remove all snow from the primary roads. In addition, there are often severe ice storms necessitating the use of salt and/or abrasives on all roadways and those sidewalks coming under the City's jurisdiction.

If, following a snow storm the amount of plowed snow warrants removal from the 78 miles of main thoroughfares, this is accomplished by using the Department's snow removal equipment, comprising of seven "Athey" belt-loaders and 29 front-end loaders, with trucks. This work force is augmented, if needed, by extra trucks and loaders hired for the occasion. After a heavy snowfall the Department hires all locally available equipment to assist in the snow removal operation. This could total over 500 trucks and 75 to 100 front-end loaders.

Further depending on the number of snowfalls and the accumulation of snow, the Department has, during the past three winters, when conditions warrant removed as much snow as possible from one side of all other streets in the City. The location of parked automobiles determines the side of the street from which the snow is removed initially. The Department attempts to remove the snow from the south and west sides of these streets, if possible, as the north and east sides do get considerably more melting help from the sun.

The City of Toronto has, for many years, dumped snow at four locations almost ideally situated for this requirement. Two land dumps in the northwest and central northeast have large capacities. Two lake dumping areas, one at Bathurst Street and the other at Leslie Street, were also ideally

situated to the southern areas of the City. The two lake sites are now closed at the request of the Province and replaced by land sites on Unwin Avenue and the Mercer Reformatory on King Street West.

At the land disposal sites, the City accepts at no charge, snow from the private sector and the Province.

Metropolitan Toronto

Metropolitan Toronto has jurisdiction over approximately 400 miles of roads. Since all of these roads are either major arteries or expressways, all are ploughed and salted. When the windrow of snow ploughed to the side of the road from pavement and sidewalk is of such an amount that it unduly interferes with the movement of vehicular and pedestrian traffic, or is hazardous, then the snow is picked up and trucked to dump sites. The size of the windrow which justifies its removal is a matter of judgment; nevertheless, snow is picked up about four or five times a winter on approximately 300 miles of road. The snow is trucked to 20 land sites and, before this year, to two lake sites. During the winter of 1970-71 for example, 11,000 truck loads of snow were dumped at the two lake sites and 42,000 truck loads were dumped at the land sites. The land sites are located mostly in the valleys and in outlying areas and can be used only when the ground is frozen sufficiently to carry the trucks. All dump sites are cleaned up and the debris removed in the spring after the snow has thawed. The Corporation also uses a mobile snow melter for disposing of snow.

Borough of North York

The Borough of North York has jurisdiction over approximately 650 miles of road. The Borough ploughs all of its roads and salts initially about 160 miles of collectors, bus routes and hills. On occasion, it may salt a further 160 miles if conditions are poor. North York does not pick up snow as their roads have either wide boulevards or shoulders and ditches.

Borough of Etobicoke

The Borough of Etobicoke maintains about 520 miles of road. The Borough ploughs all of their roads and salts about 380 miles. The Borough picks up snow from its off-street parking facilities, many arterial roads with no boulevards and some streets ending in cul-de-sacs. This snow is dumped at three land sites and into one sanitary sewer.

Borough of Scarborough

The Borough of Scarborough has jurisdiction over approximately 560 miles of road. The Borough ploughs all of their roads and spreads salt on arterials, collectors and bus routes. Snow is picked up from the roads that

are salted and from those with no boulevards and is trucked to four land sites.

Borough of East York

The Borough maintains about 100 miles of road. All roads are ploughed and salt is spread on collectors, one way streets, bus routes and over-night parking streets. In total, salt is spread on approximately 35 miles of road. Snow is picked up from the salted roads and trucked to one land dump site.

Borough of York

The Borough of York maintains about 130 miles of road. All are ploughed and salt is spread on collectors, bus routes and hills. Snow is picked up from the business areas and residential streets where congestion occurs and is trucked to one land dump site.

Department of Transportation & Communications

The Department seldom picks up snow. If any is removed it is trucked to one of their maintenance yard sites.

Private Sector

Municipal Parking Authorities generally have the snow trucked to one of the Municipal snow dump sites.

Shopping Centres generally pile the snow on their parking sites, some use snow melters.

Other private organizations make arrangements with contractors to move their snow. Often this is trucked to Municipal sites but some is dumped wherever the trucker thinks he can get away with it.

Interim Plan of Operations

For the remainder of the 1971-72 winter season present practices will be continued by the municipalities as follows:

1. Snow plowing and salting procedures will continue to be carried out with the emphasis being placed on plowing in order to minimize the amount of salt being spread.

2. The removal of snow from the sides of the road after a snowfall will not be undertaken until it reaches an accumulation causing a hazard or unreasonable inconvenience to motorists and pedestrians. Snow removal

will be postponed when moderating temperatures are forecast and snow removal will be discontinued in March when it can be expected that the snow will melt naturally.

3. Instead of being dumped directly in the harbour the snow removed from downtown Metro and City streets east of Yonge Street will be trucked to snow dumps at the foot of Leslie Street and on Unwin Avenue on the Toronto Harbour Commission property and to the snow dumps in the Don Valley north of Bloor Street.

4. Snow removed from the downtown Metro and City streets west of Yonge Street has been trucked to the former Mercer Reformatory property since direct harbour dumping was discontinued. This will be continued this year unless the dump becomes full. This could happen if heavy snowfalls are experienced since the site is not large and it is being shared by Metro and the City of Toronto.

5. If the southern land disposal sites are filled up and direct harbour dumping is practiced, the Commissioner of Metro Toronto Roads and Traffic Department and the Commissioner of the City of Toronto Streets Department will approach the Minister of the Department of the Environment for permission to direct dump in the harbour for the duration of the emergency situation.

6. The mobile snow melter owned by Metro will continue to be used to dispose of the snow by rapid melting and discharging of effluent into the storm sewer system.

The 1972-73, 1973-74 and 1974-75 seasons will be considered in the interim plan and the snow removal and disposal practices will be carried out as follows while the long term plan is being developed:

a) The practices carried out above for the 1971-72 season will continue to be followed as much as possible. It is very likely that the Mercer Reformatory site will not continue to be available for three seasons in which case efforts to obtain property for a land dump to replace it will be made. An effort is being made constantly to obtain suitable dump sites but it is very difficult particularly in the downtown area since development has eliminated most of the vacant land and most of the

remaining land is inappropriate because of inadequate drainage or proximity to residential area. In the event that a replacement cannot be found, the remarks contained above in paragraph 5 would apply.

b) The use of Metro's mobile melter as a supplement to other disposal methods will be continued and if studies continue to show that the melter is a reasonable method of snow disposal, consideration will be given to the acquisition of additional melters. The installation of permanent melters will also be considered although such installations could only be made in industrial areas.

c) Salt storage areas now being covered with tarpaulins will be contained in permanent buildings that will be erected progressively over the next few years as funds permit.

d) Early in the winter season it is not unusual for a heavy snowfall to occur before sufficient frost is in the ground to carry trucks at the dump sites. In the past when this occurred, direct dumping in the harbour was still available to accommodate snow removed from important arteries. During the interim period when there is no alternative to land dump sites, if this situation occurs it will be considered an emergency and the Minister of the Department of the Environment will be requested to approve of direct dumping in the harbour.

3. ENVIRONMENTAL IMPACT OF SNOW DISPOSAL PRACTICES

a) Results of Preliminary Water Quality Investigations

A preliminary evaluation of snow scraped from roadways shows that solid materials, chlorides, lead, copper, zinc, cadmium, iron, nitrogen, phosphorus, phenols and organic materials (BOD) are contained in the snow. The individual sources of each of these materials have not been evaluated in detail, however, it can be assumed that the pollutants are likely introduced through material filtered from the air by falling snow particles, automobile exhaust, atmospheric fallout, road salting operations, leaves, debris, animal feces, motor oil, garbage, soil and the rusting of iron.

To give some appreciation of the kinds of polluting materials in

snow and their approximate concentrations and quantities, the following table was prepared.

Parameter	Concentrations mg/l	Loading lbs/Ton Snow	Loading lbs/Truck Snow
Total Solids	10500	21	126
Chlorides	2250	4.4	26.4
Total Lead	9.8	.02	.12
Total Iron	41.5	.08	.48
Total Phosphorus	2.4	.005	.03
Organic Material (BOD_5)	57	.114	.68

The above information is based on a series of five samples of snow collected from trucks and land disposal sites and using a truck load equivalent of 6 tons. The limited amount of data may not be representative of average conditions and the reader is cautioned not to extend the quantities shown above to the total snowfall or the total quantity of snow disposed.

The floating and settleable solids if discharged directly could result in contravention of the OWRC criteria for the protection of fish and other aquatic life. The metals (lead, copper, cadmium and zinc) are potentially toxic to aquatic life and could interfere with water supplies for domestic purposes. The nutrients and chlorides may result in local water quality impairment and add to the long-term build-up of these materials in the basin.

In summary, snow scraped from roadways contains concentrations of a variety of pollutants which, if introduced directly to a watercourse, could cause the destruction of normal aquatic life and render the water unsuitable for other uses. Some of the conservative chemical pollutants will contribute to the long-term build-up of these materials in Lake Ontario.

b) Environmental Impact of Existing Disposal Practices

The snow once removed is disposed of by four principal methods, namely: direct dumping into a watercourse or Lake Ontario, land disposal, melting in one mobile snow melter with discharge to the municipal storm sewer system and direct disposal to a sanitary sewer. Each of these methods has its advantages and inherent problems. Based on a limited amount of sampling carried out to date and observation of three of the four methods (disposal to sanitary sewers has not been reviewed) the following comments are offered.

Direct disposal to a watercourse is probably the most efficient and least costly method. However, direct dumping is the least desirable

from the point of view of protecting the aquatic environment as all the contaminants and debris contained in the snow will be introduced to the watercourse. Unless water or wind currents adequately disperse the dumped materials, serious local degradation of water quality and the disruption of the aquatic community may result.

The second method, land disposal, offers the advantage of retaining the settleable solids and some of the dissolved materials thus reducing the total waste loading to a watercourse. This method, however, is more costly because following dumping, mounding is generally required. If the dumping site is parkland or land used for other purposes during the summer and fall months, use of these facilities may be delayed until the snowpiles melt and clean-up operations are completed. In practice, the use of such areas is generally prohibited. Other possible problems associated with land disposal include groundwater and soil contamination; damage to vegetation caused by the smothering effect of snow, residual sand and debris; residual salt altering the soil composition and thereby reducing its ability to sustain normal plant growth; and aesthetic impairment.

It is apparent that a great deal of care must be taken in the selection of land disposal sites.

The third method of snow disposal is rapid melting and discharging the liquid effluent to the municipal sewer system. Although samples of the effluent from the melter appear to show that the concentrations of contaminants are not very different from snow samples taken from trucks, the effluent from storm sewers show significant reductions in the concentrations of many of the parameters, noteably the settleable materials. To date, no attempt has been made to determine the diluting effects of infiltration or the contribution made by possible domestic or industrial discharges on storm sewer effluent. As well, no attempt has been made to determine if significant quantities of the material which settles in the sewer system will be flushed to the receiving waters following heavy rainfalls.

If, in fact, a portion of the polluting materials is retained in the sewers and can be removed to a suitable disposal site, melted snow directed to the sewer system may be a suitable method of snow disposal.

It has to be appreciated that the environmental impact of any one of the three above noted disposal methods is largely dependent on the physical characteristics of the receiving water. For example, lake disposal would, in most cases, prevent rapid dispersion and permit the deposition of settleable solids in the immediate vicinity of the disposal site. This, however, does not appear to apply in the case of the main lake disposal sites used in Metro Toronto because local water currents appear to be of sufficient magnitude to prevent accumulation of sediments near the disposal sites. On the other hand, the impact on rivers depends on the rate of streamflow, gradient and related flow velocities. Land disposal tends to spread the discharge of pollutants over a larger time period. Similarly, disposal to storm sewers

tend to distribute the pollutants in the melted water over a large area.

Based on the available data, it appears that land disposal or mechanical melting with discharge to the municipal sewer system will result in some reduction of the total pollution load reaching the watercourse. Until more data are available, every effort should be made to dispose of snow by these methods before direct dumping is considered.

In contrast to the above comments which essentially represent the environmental viewpoint, the following represents some of the arguments used by the operational agencies responsible for snow removal in portions of the Metropolitan Toronto area.

"In view of the fact that the cost of land dumping is higher, the continuance of the land disposal sites is not assured and, based on the knowledge of the operation, the prohibition of lake dumping does not seem justifiable. The reasons for this statement are:

1. The least possible amount of salt is being used in salting operations.

2. The snow which is picked up immediately after a storm contains relatively small amounts of salt.

3. Prohibiting lake dumping extends the time of snow removal operations and can necessitate the spreading of additional amounts of salt.

4. Salt spread anywhere in the city, eventually flows into Lake Ontario whether by direct dumping, through storm sewers or via a natural drainage channel. It is certain that land dumped snow which melts and flows into one of our rivers causes a much higher concentration in that river than ever results in the lake by direct dumping.

5. The concentration of chlorides in Lake Ontario started to increase long before the use of salt was practised in snow removal operations and in fact, since the use of salt as an agent for snow removal has been widely practised over the last twenty years, the rise of chlorides in Lake Ontario has not shown a marked increase.

6. Chloride concentrations of 25 to 30 parts per million presently exist in Lake Ontario. The Ontario Water Resources Commission's permissible concentration for "public surface water supply" is 250 parts per million".

Arguments that can be raised against the above six points include that time delays experienced when on land snow disposal is used are largely dependent on such factors as accessibility of the disposal site, the time of year, the size of the area, etc. Whether an extension of time is required and this in fact necessitates the use of additional amounts of salt requires further investigation. Also, based on Department of Transportation and Communications' experience, education and improvement of equipment which control the rate of salt application may lead to a further reduction in the use of deicing salt.

With regard to the fourth point, snow disposal to a particular site concentrates chlorides and other pollutants in the disposal area. The lack of reliable data make it difficult to argue one way or the other whether land disposal increases chloride concentrations in rivers to considerably higher levels. It appears more probable that local concentrations with lake disposal would be higher. The snow dumped on land melts over long time periods when streamflows are usually high. These two factors tend to decrease the effects of pollutants on the watercourse.

With regard to chloride levels in Lake Ontario, it is unquestionable that the inputs from industry are the major reason for the rise of chlorides. Chloride inputs through snow disposal undoubtedly contribute to the total loading to Lake Ontario, but the available data are insufficient to assess reliably the impact of salt used for snow removal operations on chloride levels in the lake.

It has been emphasized on a number of occasions that the pollution control efforts of the OWRC with regard to chlorides are precautionary and that the present chloride levels in Lake Ontario are well below the water quality criteria for public surface water supplies. The concern for snow disposal directly to Lake Ontario is based not only on chlorides but also on the possible harmful water quality impairment caused by the other pollutants present in snow.

c) Continuing Monitoring Program

To obtain a more complete picture of the effects of snow disposal on the aquatic environment, the following recommendations for a continuing monitoring program are presented.

i) General

Collect a large number of samples of snow from several areas of the Metropolitan Toronto Region at different time periods from the time of snowfall to obtain a statistically sound base for snow quality.

ii) Sampling Program Related to Direct Dumping

Conduct a sediment sampling program at a direct lake disposal

site that was in use over the past several years to measure the long-term effects of snow disposal on sediment quality and the benthic community.

iii) Sampling Program Related to Storm and Sanitary Sewer Discharges

Conduct studies to measure influent and effluent quality of water in the municipal sewer systems to determine the degree of removal of snow contaminants occuring within the system.

Collect storm sewer effluent samples during the spring, summer and fall periods and relate quality measured at these times to winter data.

iv) Sampling Program Related to Land Disposal of Snow

Measure quality of runoff from land disposal areas to determine treatment afforded by this method of snow disposal.

Establish a groundwater monitoring program to measure the effects of melted snow which percolates through the soil.

Conduct a sediment sampling program at land disposal sites.

4. LONG-TERM PROGRAM

It is apparent from the foregoing discussion that there is a significant lack of reliable technical data either for the determination of the relative significance of pollutants resulting from snow disposal compared to the year-round discharge of the same pollutants from rainfall runoff or from industrial and other sources, or which would enable alternative methods of road de-icing and snow disposal to be evaluated.

It appears obvious that extensive studies are essential before any comprehensive long-term program can be developed.

It is also apparent that such studies should not be confined to the methods and effects of snow disposal, but must include an examination of de-icing practices, and the relative economic and environmental impact of various combinations of salting and snow removal under different snow and atmospheric conditions.

The proposed study should have the following objectives:

1. To determine the relative environmental impact of present de-icing and snow disposal practices.

2. To obtain adequate data for the full evaluation of alternative practices.

3. To develop criteria for:

 - the selection and operation of land disposal sites.
 - the use of storm drains.
 - the use of sanitary or combined sewers.
 - snow melting equipment.
 - salt application.
 - operational plans under different traffic, snow and atmospheric conditions.
 - contingency plans for emergency operations.

4. To develop a detailed comprehensive plan for winter operations in the Metropolitan Toronto area which will minimize deleterious environmental effects compatible with the maintenance of safe traffic movement.

The detailed terms of reference for the study should be based on these objectives.

RECOMMENDATION

It is recommended that the Technical Task Force be formed to prepare a proposal for such a study, including detailed terms of reference with recommendation for the allotment of responsibilities and the co-ordination of research. The proposal should establish estimates of the cost for the study and provide recommendations for the necessary funding.

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January 21, 1970

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